

(12) United States Patent Gupta et al.

(54) DIRECT SCATTER LOADING OF EXECUTABLE SOFTWARE IMAGE FROM A PRIMARY PROCESSOR TO ONE OR MORE SECONDARY PROCESSOR IN A MULTI-PROCESSOR SYSTEM

(75) Inventors: **Nitin Gupta**, San Diego, CA (US);

Daniel H. Kim, San Diego, CA (US); Igor Malamant, San Diego, CA (US); Steve Haehnichen, San Diego, CA (US)

Assignee: QUALCOMM Incorporated, San

Diego, CA (US)

Subject to any disclaimer, the term of this (*) Notice:

patent is extended or adjusted under 35

U.S.C. 154(b) by 362 days.

(21) Appl. No.: 13/052,516

(22)Filed: Mar. 21, 2011

(65)**Prior Publication Data**

> US 2012/0072710 A1 Mar. 22, 2012

Related U.S. Application Data

- (60) Provisional application No. 61/324,035, filed on Apr. 14, 2010, provisional application No. 61/316,369, filed on Mar. 22, 2010, provisional application No. 61/324,122, filed on Apr. 14, 2010, provisional application No. 61/325,519, filed on Apr. 19, 2010.
- (51) Int. Cl.

G06F 15/177 (2006.01)G06F 9/445 (2006.01)G06F 9/44 (2006.01)

U.S. Cl. (52)

> CPC G06F 15/177 (2013.01); G06F 9/445 (2013.01); **G06F 9/4405** (2013.01)

712/30

US 8,838,949 B2 (10) **Patent No.:** (45) Date of Patent: Sep. 16, 2014

(58) Field of Classification Search

CPC G06F 9/4405; G06F 9/445; G06F 15/177 USPC 713/1, 2, 100; 712/E9.003, 30 See application file for complete search history.

(56)References Cited

U.S. PATENT DOCUMENTS

11/1999 Yoon 5,978,589 A 6,079,017 A 6/2000 Han et al. 11/2008 Yeh 7,447,846 B2 (Continued)

FOREIGN PATENT DOCUMENTS

EP 2034416 A1 3/2009 JP S63233460 A 9/1988 (Continued)

OTHER PUBLICATIONS

International Search Report and Written Opinion—PCT/US2011/ 029484—ISA/EPO—May 30, 2011.

Primary Examiner — M Elamin (74) Attorney, Agent, or Firm — Peter Michael Kamarchik; Nicholas J. Pauley; Joseph Agusta

(57)ABSTRACT

In a multi-processor system, an executable software image including an image header and a segmented data image is scatter loaded from a first processor to a second processor. The image header contains the target locations for the data image segments to be scatter loaded into memory of the second processor. Once the image header has been processed, the data segments may be directly loaded into the memory of the second processor without further CPU involvement from the second processor.

23 Claims, 5 Drawing Sheets

